

Subject
OB2130 Demo Board Manual

Board Model: OB2130_FOR_DEMO 2202

Doc. No.: OB_DOC_DBM_A_213000



Key Feature:

- Input voltage ranges from 3.6 V to 12 V
- Dual-channel H-bridge current control
- Output can be used together, providing up to 2A-driven output(Sampling resistance 0Ω)
- Drive a two-way DC motor or a stepping motor
- PWM winding adjustment/current limit
- Overheating turn off the circuit
- Short circuit protection
- Undervoltage lock protection
- 3.3V LDO I Load=100mA(@VM=8.0V)

Revision history:

Revise Date	Version	Reason/Issue
2022-01-26	00	First Issue

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1. System Electrical Specification

1.1 Input Characteristic

- DC input voltage rating 6 strings of 2A dry batteries
- DC input voltage 3.6V to 12V
- Handle working voltage 0 to 3.3V

1.2 System parameters

- LDO output voltage 3.3V
- LDO output current 100mA
- Current sampling resistance 1 Ω

1.3 Output characteristic

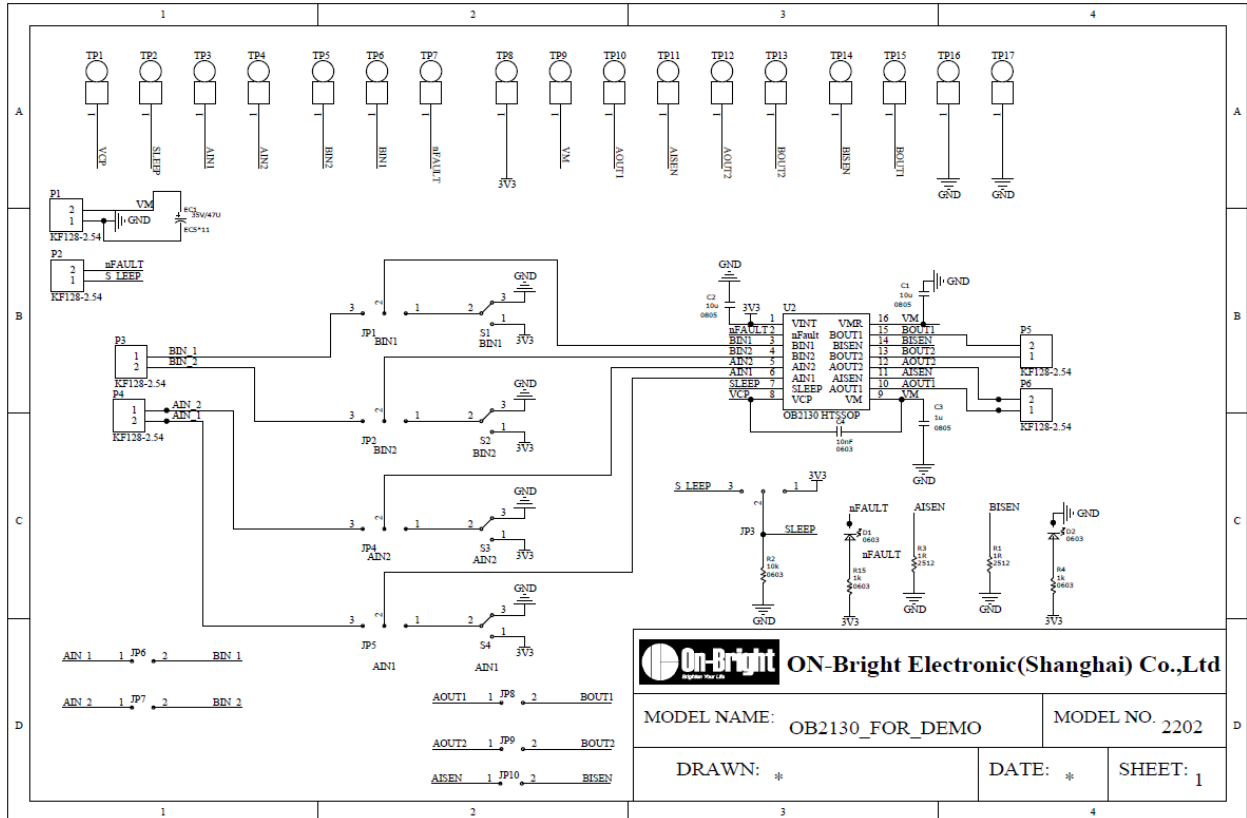
- Phase current 200mA(Sampling resistance 1 Ω , Single-channel output)

1.4 Environmental

- Operating Ambient Temperature -20 $^{\circ}\text{C}$ to 60 $^{\circ}\text{C}$
- Storage Temperature -40 $^{\circ}\text{C}$ to 100 $^{\circ}\text{C}$
- Storage Humidity 0% to 95% R.H.

2. Board Information

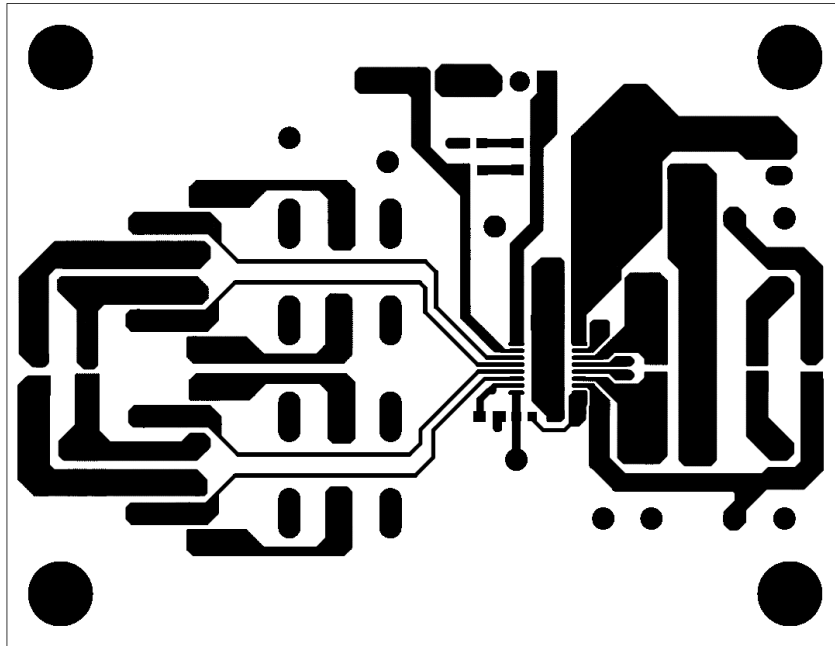
2.1 Schematic



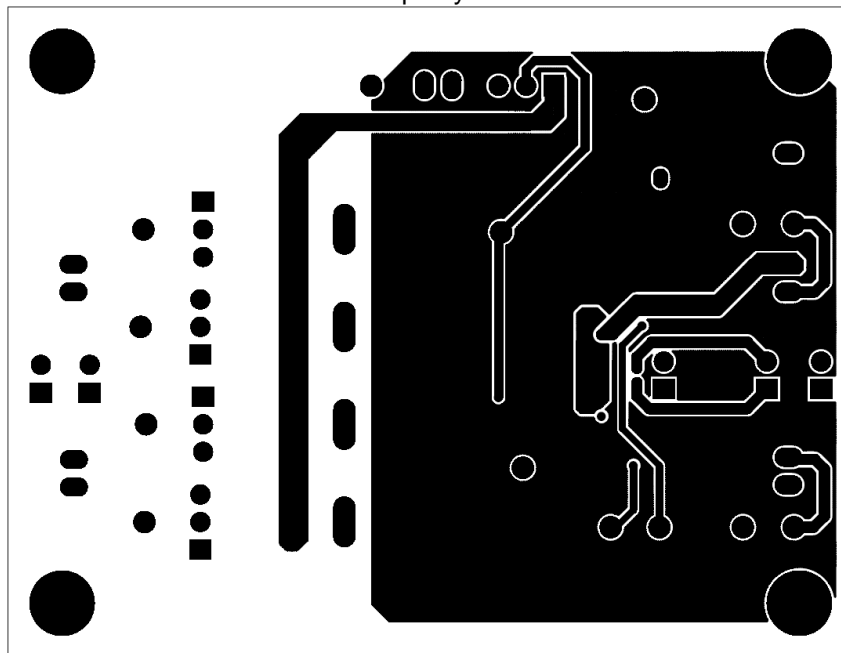
2.2 Bill of material

Position	Description	Package	QTY
C1,C2	Capacitor,ceramic,10uf/25V,X7R,10%	0805	2
C3	Capacitor,ceramic,1uf/25V,X7R,10%	0805	1
C4	Capacitor,ceramic,10nf/25V,X7R,10%	0603	1
EC1	Capacitor, aluminum electrolytic,47uf/35V,-40/105 度	5*11	1
R2	Resistor,chip,10k,5%	0603	1
R4,R15	Resistor,chip,1k,5%	0603	2
R1,R3	Resistor,chip,1R,1%,1W	1210	2
D1	LED, Red	0603	1
D2	LED, Green	0603	1
P1, P2, P3, P4, P5, P6	KF128-2.5mm		6
JP1, JP2, JP3, JP4, JP5	3Pin 2.54mm 插针		5
JP1, JP2,JP4, JP5	2.54mm 跳线帽		4
JP6, JP7, JP8, JP9, JP10	2Pin 2.54mm 插针		5
S1, S2, S3, S4	MTS-102 3 脚 2 档		4
U1	OB2130	HTSSOP16	1

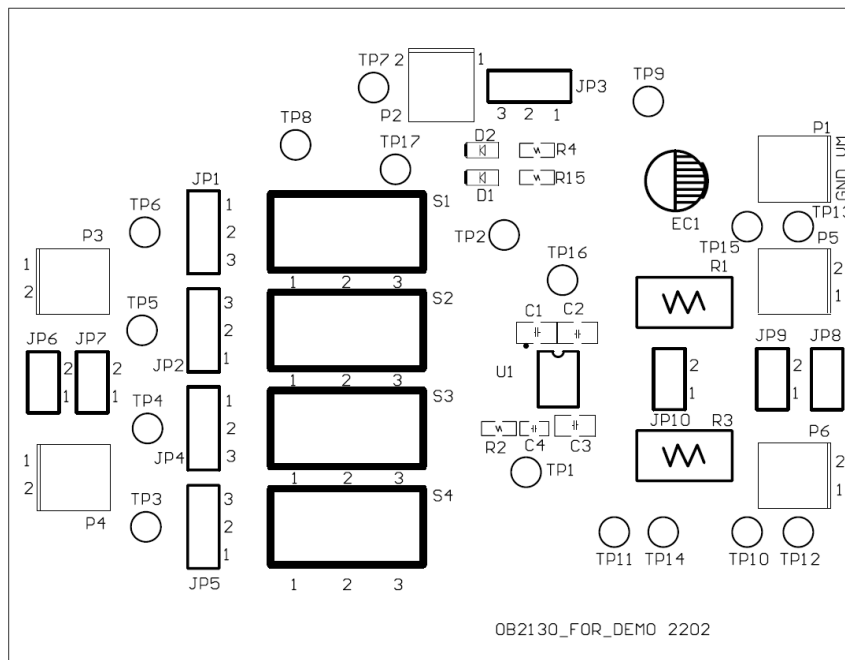
2.3 PCB Garber File



Top Layer

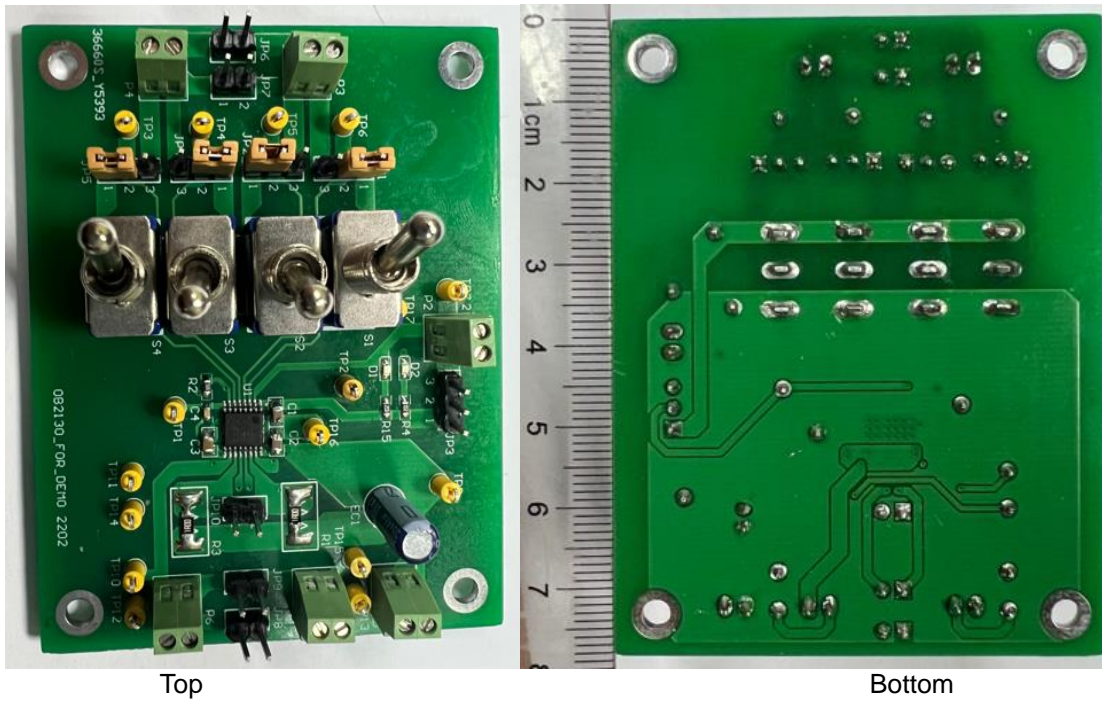


Bottom Layer



Silkscreen Top

2.4 BLDC Controller Board Snapshot



2.5 Connector Function Description

2.5.1 Power Input

P1	Signal name	Description
1	GND	Power-(0V)
2	VM	Power+(0-12V)

2.5.2 Control Signal

P2	Signal name	Description
1	S_SLEEP	MCU GPIO/EXT signal to SLEEP(0/3.3V/5V)
2	nFAULT	Fault Output(0/3.3V)

2.5.3 Motor Input

P3	Signal name	Description
1	BIN_1	MCU GPIO/EXT signal to BIN1(0/3.3V/5V)
2	BIN_2	MCU GPIO/EXT signal to BIN2(0/3.3V/5V)

P4	Signal name	Description
1	AIN_2	MCU GPIO/EXT signal to AIN2(0/3.3V/5V)
2	AIN_1	MCU GPIO/EXT signal to AIN1(0/3.3V/5V)

2.5.4 Motor Output

P5	Signal name	Description
1	BOUT2	Bridge B output 2
2	BOUT1	Bridge B output 1

P6	Signal name	Description
1	AOUT1	Bridge A output 1
2	AOUT2	Bridge A output 2

2.6 Jumper Function Description

2.6.1 SLEEP

Jumper	Signal name	Setting	Connection
JP3	Sleep	1-2	Internal 3V3 signal to Sleep
		2-3	MCU GPIO/EXT signal to Sleep(0/3.3V/5V)

2.6.2 xINX Signal

Jumper	Signal name	Setting	Connection
JP1	BIN1	1-2	Internal 3V3/GND signal to BIN1(0/3.3V)
		2-3	MCU GPIO/EXT signal to BIN1(0/3.3V/5V)
JP2	BIN2	1-2	Internal 3V3/GND signal to BIN2(0/3.3V)
		2-3	MCU GPIO/EXT signal to BIN2(0/3.3V/5V)
JP4	AIN2	1-2	Internal 3V3/GND signal to AIN2(0/3.3V)

		2-3	MCU GPIO/EXT signal to AIN2(0/3.3V/5V)
JP5	AIN1	1-2	Internal 3V3/GND signal to AIN1(0/3.3V)
		2-3	MCU GPIO/EXT signal to AIN1(0/3.3V/5V)

2.6.3 System Parallel Output or Independent Output(MCU GPIO/EXT signal)

Jumper	Signal name	Setting	Description
JP6	AIN1/BIN1	Short Connection	Parallel output
JP7	AIN2/BIN2		
JP8	AOUT1/BOOUT1		
JP9	AOUT2/BOOUT2		
JP10	AISEN/BISEN		

Jumper	Signal name	Setting	Description
JP6	AIN1/BIN1	Suspension	Independent output
JP7	AIN2/BIN2		
JP8	AOUT1/BOOUT1		
JP9	AOUT2/BOOUT2		
JP10	AISEN/BISEN		

2.7 Switch Function Description

Switch	Signal name	Setting	Connection
S1	BIN1	1-2	Internal 3V3 signal to BIN1
		2-3	Internal GND signal to BIN1
S2	BIN2	1-2	Internal 3V3 signal to BIN2
		2-3	Internal GND signal to BIN2
S3	AIN2	1-2	Internal 3V3 signal to AIN2
		2-3	Internal GND signal to AIN2
S4	AIN1	1-2	Internal 3V3 signal to AIN1
		2-3	Internal GND signal to AIN1

- Remarks :
- When typing in parallel with MCU GPIO/EXT signal , JP6、JP7 short connection , JP8 , JP9 , JP10 short connection , JP1、JP2、JP4、JP5 2 , 3 pin short connection.
 - When typing in parallel with internal 3V3/GND signal , S1、S4 connect the same level signal , S2、S3 connect the same level signal , JP8 , JP9 , JP10 short connection , JP1、JP2、JP4、JP5 1 , 2 pin short connection.
 - When using MCU GPIO/EXT signal for independent input , JP6、JP7、JP8、JP9、JP10 suspension , JP1、JP2、JP4、JP5 2、3 pin short connection.
 - When using internal 3V3/GND signal for independent input , JP6、JP7、JP8、JP9、JP10 suspension , JP1、JP2、JP4、JP5 1、2 pin short connection.

2.8 Test Point Function Description

Test point	Signal name	Description
TP1	VCP	Output Voltage of Charge Pump
TP2	SLEEP	Sleep Mode Input
TP3	AIN1	Bridge A input 1
TP4	AIN2	Bridge A input 2
TP5	BIN2	Bridge B input 2
TP6	BIN1	Bridge B input 1
TP7	nFAULT	Fault Output
TP8	3V3	3.3V LDO
TP9	VM	Power Supply of the Chip
TP10	AOUT1	Bridge A output 1
TP11	AISEN	Bridge A Ground/ Isense
TP12	AOUT2	Bridge A output 2
TP13	BOUT2	Bridge B output 2
TP14	BISEN	Bridge B Ground/ Isense
TP15	BOUT1	Bridge B output 1
TP16	GND	Ground of the Chip
TP17	GND	Ground of the Chip

2.9 LED Function Description

The diode D1 indicates the status of the FAULT signal. When there is a FAULT condition on the OB2130, this LED lights up. The three possible fault conditions are over current , over temperature and under voltage.

The diode D2 indicates the status of the LDO output signal. Refer to the schematic / datasheet for more information.

2.10 Current Sense Resistor

R1 and R3 are the current sense resistors directly connected to AISEN and BISEN respectively. The other side of this resistor is connected to GND. The value of this resistor is chosen to be 1 Ω . This value controls the current through the OB2130 to be 200 mA. To change this value of regulating current, this resistor value must be changed as mentioned in the datasheet.

3. Performance Evaluation

This session presents the test results of OB2130 DEMO. TA=25°C

No	Parameter	Symbol	Min	Type	Max	Unit	Corresponding Fig.
1	Battery UVP	V _{bus_UVLO}		3.7		V	Fig.7
2	LDO 3.3V	LDO_3V3	3.25	3.3	3.33	V	Fig.6
3	LDO 3.3V Current			100		mA	Fig.6
4	LDO 3.3V Power On Time			176		us	Fig.5
5	VM sleep mode supply current			0.293		mA	Fig.13
6	nFault recovery time			1.368		ms	Fig.2
7	System Stabilized Time			105		ms	Fig.1
8	Power on time			75.4		us	Fig.3
9	Power off time			195.5		ms	Fig.4
10	Vds Peak voltage	Vds			12.69	V	Fig.8/Fig.9
11	Short Current				18.4	A	Fig.12
12	Load Current				2.592	A	Fig.2
13	MOSFET current shutdown time in MOTOR short circuit				8	us	Fig10/Fig11/Fig12
14	MOSFET Vds in MOTOR short circuit	Vds			15.75	V	Fig10/Fig11/Fig12

Test Equipments

Item	Module
DC source	LW12050KD
Oscilloscope	LeCroy HDO420
Current meter	Tek TCPA300
Multi-meter	VC9808

3.1 System Stabilization Time Test

3.1.1 System Stabilized Time

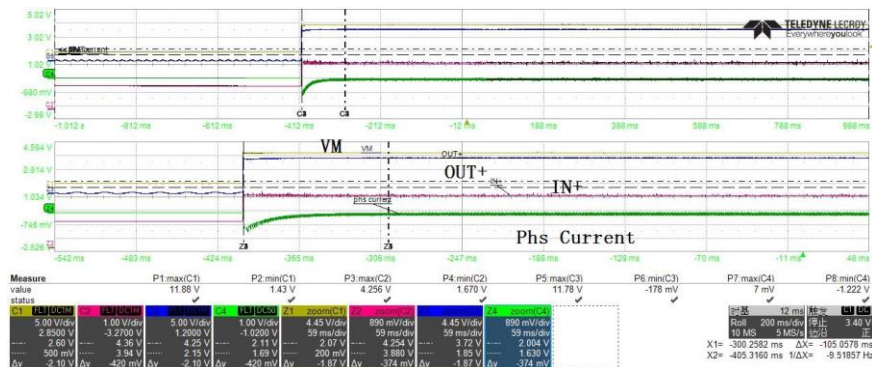


Fig. 1 Measured VM(C1 Yellow), IN+(C2 Red), OUT+(C3 Blue), Phs Current(C4 Green) @ bus = 11.4V Stable running time of motor = 105ms

3.2 Max Out Current Test(Out Parallel Connection)@VM=12V

3.2.1 Max Out Current



Fig. 2 Measured OUT+(C1 Yellow), OUT-(C2 Red), nFault(C3 Blue), Phs Current(C4 Green) @ bus = 12V

3.3 Voltage Test

3.3.1 System ON/OFF



Fig. 3 Measured VM(C1 Yellow), IN+(C2 Red), OUT+(C3 Blue), Phs Current(C4 Green) @battery voltage =11.4V Power On Time =75.4us

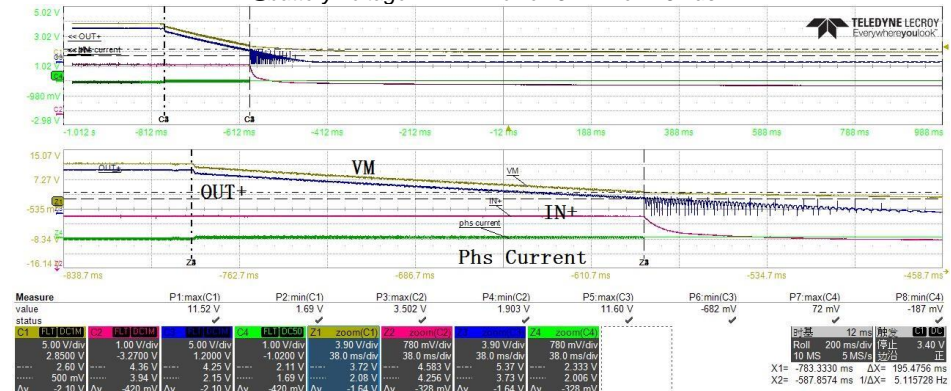


Fig. 4 Measured VM(C1 Yellow), IN+(C2 Red), OUT+(C3 Blue), Phs Current(C4 Green) @battery voltage =11.4V Power Off Time =195.5ms

3.3.2 3V3 Voltage

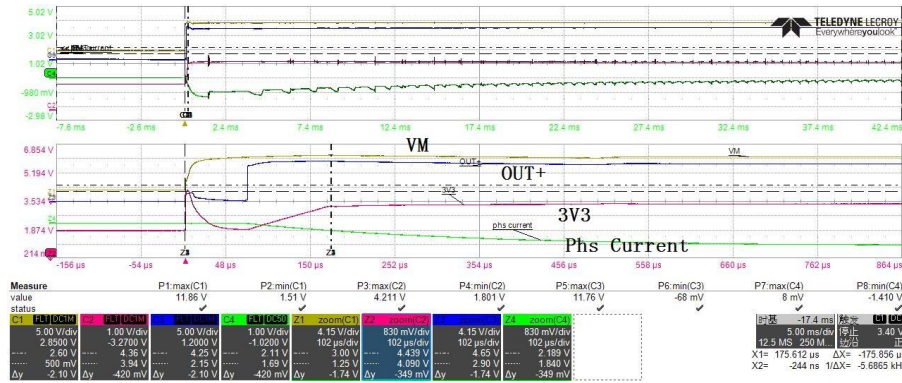


Fig. 5 Measured VM(C1 Yellow),3V3(C2 Red),OUT+(C3 Blue),Phs Current(C4 Green)
@battery voltage =11.4V 3V3 Power On Time =176us

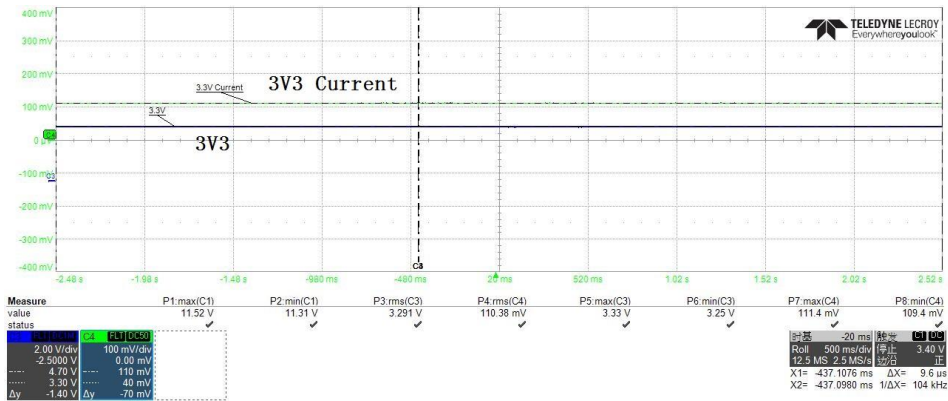


Fig. 6 Measured 3V3(C3 Blue),3V3 Current(C4 Green) @battery voltage =11.4V

3.3.3 UVLO

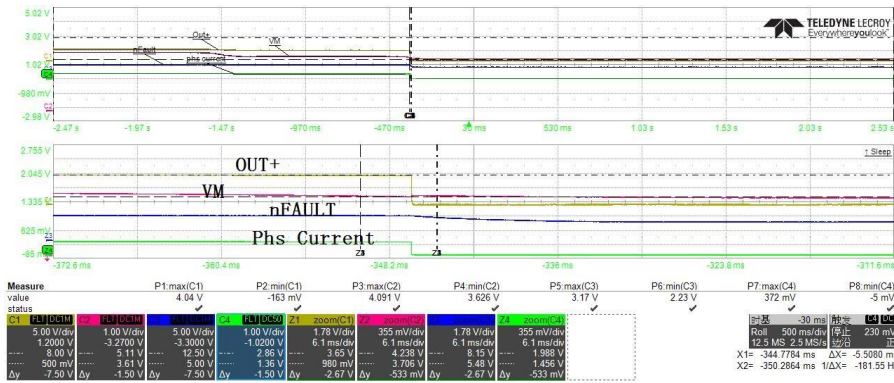


Fig. 7 Measured OUT+(C1 Yellow),VM(C2 Red),nFault(C3 Blue),Phs Current(C4 Green)
@battery voltage =11.4V

3.3.4 Vds Strike Voltage @ Bus = 12V

	BOUT1+	BOUT2+
Vds / V	12.69V	12.69V
	BOUT1-	BOUT2-
Vds / V	11.93V	11.99V

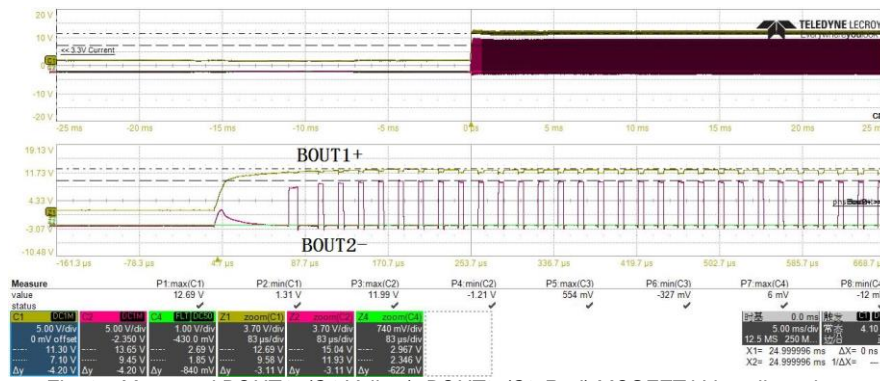


Fig. 8 Measured BOUT1+(C1 Yellow), BOUT2-(C2 Red) MOSFET Vds strike voltage @ bus = 12V

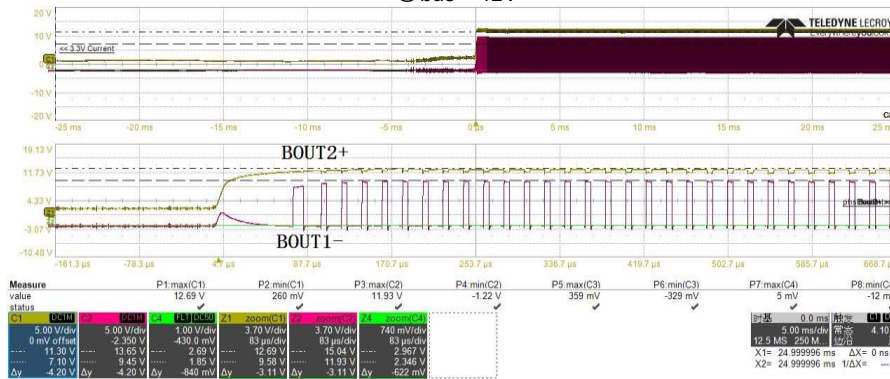


Fig. 9 Measured BOUT2+(C1 Yellow), BOUT1-(C2 Red) MOSFET Vds strike voltage @ bus = 12V

3.4 Motor Short Circuit Protection(Output parallel connection) @ Bus = 12V

3.4.1 OUT+ - OUT- short circuit

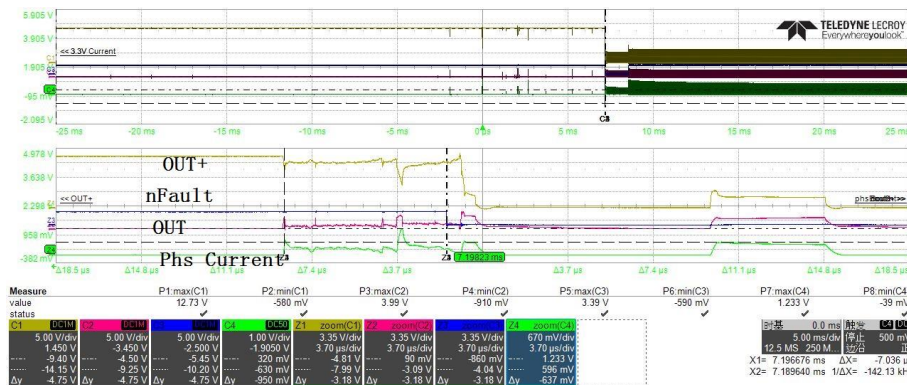


Fig. 10 Measured OUT+(C1 Yellow)/OUT-(C2 Red)-phase voltage,nFault(Blue),Phs Current(C4 Green) @battery voltage =12V

3.4.2 OUT+ - GND short circuit

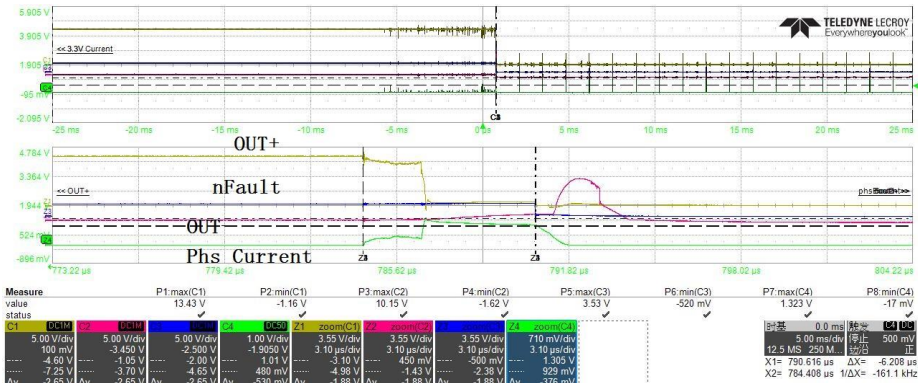


Fig. 11 Measured OUT+(C1 Yellow)/OUT-(C2 Red)-phase voltage,nFault(Blue),Phs Current(C4 Green) @battery voltage =12V

3.4.3 OUT- - VM short circuit

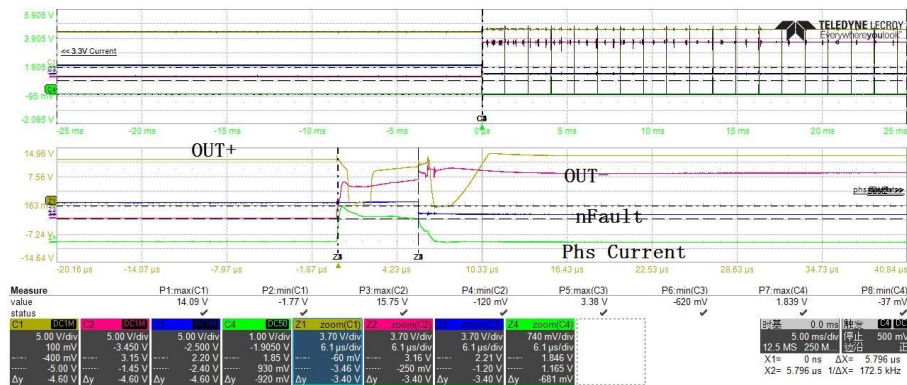


Fig. 12 Measured OUT+(C1 Yellow)/OUT-(C2 Red)-phase voltage,nFault(Blue),Phs Current(C4 Green) @battery voltage =12V

3.5 Sleep Test

3.5.1 Sleep

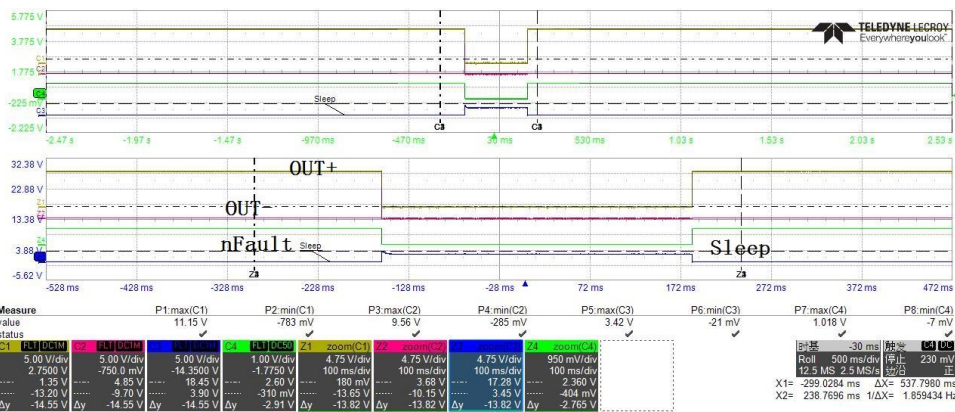


Fig. 13 Measured OUT+(C1 Yellow)/OUT-(C2 Red)-phase voltage,Sleep(C3 Blue), nFault (C4 Green) @battery voltage =11.4V

3.6 Temperature Test

3.6.1 Temperature measure

Setup : Bus voltage = 11.4V, Bus Current = 1.7A, Output short connection, Sampling resistance 0Ω, TA = 70°C

	OB2130
0min	70°C
30min	131.7°C
60min	131.5°C
90min	131.6°C
120min	131.5°C

3.7 Reliability

3.7.1 Low Temperature Reliability

Setup: TA = -40°C, Bus Voltage = 11.4V

Result: Pass

3.7.2 High Temperature Reliability

Setup: TA = 60°C, Bus Voltage = 11.4V

Result: Pass

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